

**CLAIMS**

1. Substantially pure chromium dioxide ( $\text{CrO}_2$ ) having saturation magnetization of at least 115 emu/gm.
2. Chromium dioxide according to claim 1 having saturation magnetization of at least 120 emu/gm.
3. Chromium dioxide according to claim 2 having saturation magnetization of 126 emu/gm for sintered pellets.
4. Chromium dioxide according to claim 2 having saturation magnetization of 132 to 135 emu/gm for cold pressed form.
5. Chromium dioxide according to claim 1, which is in polycrystalline form.
6. Chromium dioxide according to claim 1 having negative magnetoresistance of at least 0.5% near room temperature at 2 Tesla.
7. Chromium dioxide according to claim 6 having negative magnetoresistance of at least 2% near room temperature at 2 Tesla.
8. Chromium dioxide according to claim 7 having negative magnetoresistance of about 5% near room temperature at 2 Tesla.
9. Composites of chromium dioxide and chromium sesquioxide ( $\text{CrO}_2/\text{Cr}_2\text{O}_3$ ) having negative magnetoresistance of at least 0.5% near room temperature at 2 Tesla.

10. Composites according to claim 9, having negative magnetoresistance of at least 2% near room temperature at 2 Tesla.
11. Composites according to claim 10, having negative magnetoresistance of at least 5% near room temperature at 2 Tesla.
12. Composites according to claim 11, having negative magnetoresistance of 8% near room temperature at 2 Tesla for a 25% molar  $\text{Cr}_2\text{O}_3$  composite, which is cold pressed.
13. Composites according to claim 11, having negative magnetoresistance of 33% near room temperature at 2 Tesla for a 40% molar  $\text{Cr}_2\text{O}_3$  composite, which is sintered.
14. Composites according to claim 9, having saturation magnetization of 75 emu/gm at 5K for a sintered 40% molar  $\text{Cr}_2\text{O}_3$  composite.
15. Composites according to claim 9, having saturation magnetization of 103 emu/gm at 5K for a cold pressed composite of 25% molar  $\text{Cr}_2\text{O}_3$ .
16. Composites of chromium dioxide and  $\text{Cr}_2\text{O}_5$  ( $\text{CrO}_2/\text{Cr}_2\text{O}_5$ ) having negative magnetoresistance of at least 0.5% near room temperature at 2 Tesla.
17. Composites according to claim 16, having negative magnetoresistance of at least 2% near room temperature at 2 Tesla.

18. Composites according to claim 17, having negative magnetoresistance of atleast 5% near room temperature at 2 Tesla.
19. Composites according to claim 18, having negative magnetoresistance of about 8% at 2T near room temperature for a sintered composite with 80 emu/g  $M_s$ .
20. Composites according to claim 18, having negative magnetoresistance of about 22% at 2T near room temperature for a sintered composite with 60 emu/g  $M_s$ .
21. Composites according to claims 9 or 16, which can be obtained in cold and sintered form.
22. Composites according to claim 9 or 16, which is homogenous.
23. Composites according to claim 9 or 16, which is obtainable in any ratio of the constituent compounds.
24. Composites according to claim 9 or 16, which has substantial reproducibility in sintered form.
25. A process for manufacture of substantially pure chromium dioxide ( $CrO_2$ ), or composites of chromium dioxide and chromium sesquioxide ( $CrO_2/Cr_2O_3$ ) or composites of chromium dioxide and  $Cr_2O_5$  ( $CrO_2/Cr_2O_5$ ) comprising heating an intermediate oxide to a temperature of between 350 and 500°C for a period of between 1-5 hours whereby substantially pure chromium dioxide ( $CrO_2$ ), or composites of chromium dioxide or chromium sesquioxide ( $CrO_2/Cr_2O_3$ ) or composites of chromium dioxide and  $Cr_2O_5$  ( $CrO_2/Cr_2O_5$ ) are formed.

26. A process according to claim 25, wherein intermediate oxide is converted to said substantially pure chromium dioxide  $\text{CrO}_2$  when the temperature is maintained between  $390\text{-}400^\circ\text{C}$  or to a composite of chromium dioxide and chromium sesquioxide ( $\text{CrO}_2/\text{Cr}_2\text{O}_3$ ) when the temperature is maintained between  $400\text{-}500^\circ\text{C}$  or to a composite of chromium dioxide and  $\text{Cr}_2\text{O}_5$  ( $\text{CrO}_2/\text{Cr}_2\text{O}_5$ ) when the temperature is maintained between  $350\text{-}390^\circ\text{C}$ .
27. A process according to claim 25, wherein intermediate oxide used in the process of the invention is prepared by heating  $\text{CrO}_3$  and maintaining the temperature in the range of  $230\text{-}320^\circ\text{C}$ , preferably in the range  $250\text{-}280^\circ\text{C}$ .
28. A process according to any of claims 25 to 27, wherein said  $\text{CrO}_3$  is heated and maintained in the said temperature range for 6-14 hours, preferably 8-12 hours.
29. A process according to claim 28, wherein  $\text{CrO}_3$  is heated in dry oxygen/air.
30. A process according to claim 28, wherein  $\text{CrO}_3$  is heated at about atmospheric pressure.
31. A process according claim 28, wherein  $\text{CrO}_3$  is heated slowly to raise the temperature to about  $250^\circ\text{C}$  and then maintained in the said temperature range.
32. A process according to claim 25, wherein intermediate oxide thus formed is cooled slowly to room temperature preferably at the same rate as it was heated.

33. A process according to claim 25, wherein intermediate oxide is crushed in powder form.
34. A process according to claim 25, wherein the said intermediate oxide in powder form is sealed in a tube or can be palletized and sintered before sealing in a glass tube.
35. A process according to any of the claims 25 to 34, wherein the temperature of intermediate oxide is maintained in the said range for 2-3 hrs.
36. A process according to any of the claims 27 to 35, wherein in the composites of  $\text{CrO}_2/\text{Cr}_2\text{O}_3$  and  $\text{CrO}_2/\text{Cr}_2\text{O}_5$ , the mass fraction of  $\text{Cr}_2\text{O}_3$  or  $\text{Cr}_2\text{O}_5$  can be systematically varied by varying the temperature between 400 and 500°C.
37. Substantially pure chromium dioxide ( $\text{CrO}_2$ ) manufactured by a process according to claim 25.
38. Composites of chromium dioxide and chromium sesquioxide ( $\text{CrO}_2/\text{Cr}_2\text{O}_3$ ) manufactured by a process according to claim 25.
39. Composites of chromium dioxide and  $\text{CrO}_5$  ( $\text{CrO}_2/\text{Cr}_2\text{O}_5$ ) manufactured by the process according to claim 25.